

WE CLAIM:

1. A tactile sensor for detecting contact therewith in an ambient environment comprising:
 - a pneumatic diaphragm having a first diaphragm side and a second diaphragm side, where said second diaphragm side is in pneumatic communication with said ambient environment through a second fluid;
 - a sensing bladder having a first sensing bladder side and a second sensing bladder side, where said second sensing bladder side is in pneumatic communication with said ambient environment;
 - a first atrium enclosing a first fluid, said first atrium comprising said first diaphragm side and said first sensing bladder side; and
 - a mechanical connection in contact with said pneumatic diaphragm for detecting movement of said pneumatic diaphragm.
2. The tactile sensor of claim 1, wherein said second diaphragm side is in fluid communication with said ambient environment through said second fluid.
3. The tactile sensor of claim 1, wherein said second diaphragm side is in fluid isolation from said ambient environment.
4. The tactile sensor of claim 1, wherein said second diaphragm side is pneumatically biased against said first diaphragm side.
5. The tactile sensor of claim 1, wherein at least one of said first fluid and said second fluid is a liquid.
6. The tactile sensor of claim 1, wherein at least one of said first fluid and said second fluid is a gas.

7. The tactile sensor of claim 1, wherein at least one of said first fluid and said second fluid comprise water.

8. The tactile sensor of claim 1, wherein at least one of said first fluid and said second fluid comprise an organic liquid.

9. The tactile sensor of claim 8, wherein at least one of said first fluid and said second fluid comprise glycerin.

10. A tactile sensor for detecting contact therewith in an ambient environment comprising:

a pneumatic diaphragm having a first diaphragm side and a second diaphragm side, where said second diaphragm side is in pneumatic communication with said ambient environment;

said first diaphragm side being pneumatically biased against said second diaphragm side through said pneumatic diaphragm;

a sensing bladder having a first sensing bladder side and a second sensing bladder side, where said second sensing bladder side is in pneumatic communication with said ambient environment;

a compensation bladder having a first compensation bladder side and a second compensation bladder side, where said second compensation bladder side is in pneumatic communication with said ambient environment;

a first atrium enclosing a first fluid, said first atrium comprising said first diaphragm side and said first sensing bladder side;

a second atrium enclosing a second fluid; said second atrium comprising said second diaphragm side and said first compensation bladder side; and

a mechanical connection in contact with said pneumatic diaphragm for detecting movement of said pneumatic diaphragm.

11. The tactile sensor of claim 10, wherein said first atrium includes a sensing conduit arranged between said first diaphragm side, and said first sensing bladder side, and

said sensing conduit is formed from a rigid material.

12. The tactile sensor of claim 10, wherein said sensing bladder comprises a pliable elastomeric material.

13. The tactile sensor of claim 12, wherein said first sensing bladder side comprises an inner wall of a vinyl tube sealed on one end, and said second sensing bladder side comprises an outer wall of said vinyl tube separated from said inner wall of said vinyl tube by a tube thickness.

14. The tactile sensor of claim 10, wherein said sensing bladder is disposed within a flexible sheath.

15. The tactile sensor of claim 10, wherein said first compensation bladder side comprises an inner wall of a finger glove;

said inner wall of said finger glove is sealingly attached about an outer circumference of a hollow rigid member, and

5 said second compensation bladder side comprises an outer wall of said finger glove separated from said inner wall of said finger glove by a glove thickness.

16. The tactile sensor of claim 10, wherein said mechanical connection in contact with said pneumatic diaphragm for detecting movement of said pneumatic diaphragm includes an electric switch in mechanical communication with said diaphragm, said electric switch being actuatable by a
5 displacement of said first fluid within said first sensing bladder side.

17. The tactile sensor of claim 16, wherein said electric switch is an on-off electric switch.

18. The tactile sensor of claim 16, wherein said electric switch is capable of modulating an electric signal, is capable of attenuating an electric signal, or both.

19. The tactile sensor of claim 16, wherein said mechanical connection in contact with said pneumatic diaphragm for detecting movement of said pneumatic diaphragm includes a means of adjusting an amount of actuation of said electric switch in proportion to an amount of said displacement
5 of said first fluid within said first sensing bladder side.

20. A tactile sensor for detecting contact therewith in an ambient environment comprising:

a plurality of pneumatic diaphragms, at least one of said pneumatic diaphragms having a first diaphragm side and a second diaphragm
5 side, where said second diaphragm side is in pneumatic communication with said ambient environment through a second fluid;

a plurality of sensing bladders, at least one of said sensing bladders having a first sensing bladder side and a second sensing bladder side, where said second sensing bladder side is in pneumatic communication with
10 said ambient environment;

a first atrium enclosing a first fluid, said first atrium comprising said first diaphragm side and said first sensing bladder side; and

a mechanical connection in contact with said at least one pneumatic diaphragm for detecting movement of said at least one pneumatic
15 diaphragm.

21. The tactile sensor of claim 20, wherein:
each of said plurality of pneumatic diaphragms has a first diaphragm side and a second diaphragm side,
each of said second diaphragm sides being in pneumatic
5 communication with said ambient environment through said second fluid;
each of said sensing bladders having a first sensing bladder side and a second sensing bladder side, where said second sensing bladder side is in pneumatic communication with said ambient environment;
a plurality of first atriums enclosing a first fluid, each of said first
10 atriums comprising one of said first diaphragm sides and one of said first sensing bladder sides; and
a plurality of mechanical connections each in contact with one of said pneumatic diaphragms for detecting movement of said one pneumatic diaphragm.

22. The tactile sensor of claim 21, wherein said plurality of sensing bladders form an array arranged in a grid along perpendicular axis's.

23. The tactile sensor of claim 21, wherein each of said second diaphragm sides are in fluid communication with a first compensation bladder side of a single compensation bladder, said single compensation bladder having a second compensation bladder side in fluid communication with said ambient
5 environment.

24. The tactile sensor of claim 21, wherein each of said second diaphragm sides are in fluid communication with a first compensation bladder side of one of a plurality of compensation bladders, each of said plurality of compensation bladders having a second compensation bladder side in fluid
5 communication with said ambient environment.

25. A tactile sensor for detecting contact therewith in an ambient environment comprising:

- a pneumatic diaphragm having a first diaphragm side and a second diaphragm side, where said second diaphragm side is in pneumatic communication with said ambient environment;
5 said first diaphragm side being biased against said second diaphragm side through said pneumatic diaphragm;
- a sensing bladder having a first sensing bladder side and a second sensing bladder side, where said second sensing bladder side is in pneumatic communication with said ambient environment;
10 said first sensing bladder side comprising an inner wall of a vinyl tube sealed on one end, and said second sensing bladder side comprising an outer wall of said vinyl tube separated from said inner wall of said vinyl tube by a tube thickness;
- 15 a compensation bladder having a first compensation bladder side and a second compensation bladder side, where said second compensation bladder side is in pneumatic communication with said ambient environment;
said first compensation bladder side comprising an inner finger glove wall of a finger glove, where said inner finger glove wall is sealingly attached about an outer circumference of a hollow rigid member, and said
20 second compensation bladder side comprising an outer finger glove wall of said finger glove separated from said inner finger glove wall by a glove thickness;
- a first atrium enclosing a first fluid, said first atrium comprising said first diaphragm side and said first sensing bladder side;
- 25 a second atrium enclosing a second fluid; said second atrium comprising said second diaphragm side and said first compensation bladder side; and
- a mechanical connection in contact with said pneumatic diaphragm for detecting movement of said pneumatic diaphragm.

26. The tactile sensor of claim 25, wherein said electric switch is capable of modulating an electric signal, is capable of attenuating an electric signal, or both.

27 A method to tactilely sense an object comprising the step of:
contacting an object in an ambient environment with a sensing bladder of a tactile sensor,

said tactile sensor comprising:

5 a pneumatic diaphragm having a first diaphragm side and a second diaphragm side, where said second diaphragm side is in pneumatic communication with said ambient environment through a second fluid;

a sensing bladder having a first sensing bladder side and a second sensing bladder side, where said second sensing bladder side is in
10 pneumatic communication with said ambient environment;

a first atrium enclosing a first fluid, said first atrium comprising said first diaphragm side and said first sensing bladder side; and

a mechanical connection in contact with said pneumatic diaphragm for detecting movement of said pneumatic diaphragm.

28. The method of claim 27, further comprising the step of determining an output value of an electrical switch in mechanical communication with said mechanical connection in contact with said pneumatic diaphragm for detecting movement of said pneumatic diaphragm.

29. The method of claim 27, wherein said second diaphragm side is in fluid isolation from said ambient environment.

30. The method of claim 27, wherein said second diaphragm side is in fluid communication with said ambient environment.